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The Distribution of Southern California Pteridophytes.

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The purpose of this paper is to bring up to date the available information on the distribution of Southern California pteridophytes. The last comprehensive treatment of this subject was by Parish (Fern Bull. 12: 1-15. 1904), in a discussion of the fern flora of California. As his paper dealt with the whole state, distribution for the southern part was not given as definitely as might be wished; furthermore much additional information has accumulated in recent years and has made it seem desirable that there be made a critical restatement of the whole subject. This paper is the outcome of special study of the literature; of comprehensive herbarium-work, in which all the important herbaria of the state were examined; and finally, of several years collecting in practically all parts of Southern California.

As here used, "Southern California" is, as generally understood, those counties east and south of Santa Barbara County and the desert portion of Kern County south of the Tehachepi Mountains. Included in the range also are the Channel Islands which lie just off

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the coast of Southern California. Mention is made also of records from Inyo County, which is a continuation of the same phytogeographic area as that to the south, only when light is thereby shed on Southern California distribution, but no reference is made to certain strictly Sierran species occurring there.

Roughly speaking, Southern California consists of three parts: coastal, mountain, and desert. The coastal is that part west of the mountains and draining directly into the Pacific Ocean. The desert area is that lying east of the mountains and constituting the Mohave and Colorado Deserts. The mountain area is that series of high ridges dividing the two former areas; the most important sections are known as the Mt. Pinos region, the San Gabriel, the San Bernardino, San Jacinto, and Cuyamaca Mountain ranges.

In trying to assign to each species considered its life-zone, we have in general followed the Merriam system as applied by Hall (Univ. Cal. Pub. Bot. **3**: 9-12. 1907), and Abrams (Bull. N. Y. Bot. Gard. **6**: 307-322. 1910). But we have assigned all the region west of the mountains to the Upper Sonoran Zone, excepting only small unimportant areas in San Bernardino and San Diego Counties.

The climate of Southern California is universally conceded to be dry, but it is a remarkable fact that there grow in this area no less than fifty species of pteridophytes. This situation is only to be explained by the diversity of habitat and range of altitude. It does not seem necessary to enter into a detailed discussion of the characteristics of the fern flora taken as a whole, since this subject has been very interestingly set forth by Parish (Am. Fern Jour. **5**: 97-104. 1915), but in this connection the following table is worth noting:

TABLE 1. NUMBER OF PTERIDOPHYTES IN SO. CALIF.

Polypodiaceae	33 sp. and 4 vars.
Ophioglossaceae	3 sp.
Marsileaceae	2 sp.
Salviniaceae	1 sp.
Isoetaceae	2 sp.
Selaginellaceae	6 sp.
Equisetaceae	4 sp.
Total	51 sp. and 4 varieties.

In an attempt to make the paper more useful, we have given keys to the genera and species and have listed illustrations, particularly those latter which were based on West American material. It has been thought best to cite authorities and references for many locality records. We have attempted, however, to distinguish between those localities which we know only through the literature and those from which we have examined material. The localities marked with an exclamation sign are those from which we have seen specimens which we believe to be correctly named as indicated. When definite localities have been given, we have usually given a reference or cited specimens; if the latter and the collection is unnumbered, we have indicated the herbarium in which it was seen. We have attempted also to verify all records and to indicate all errors and misidentifications existing in the literature concerned with our area.

The authors know only too well that the present paper does not exhaust the subject, the preparatory study having shown how little definite information there is regarding the fern flora of Southern California. It is our intention to continue such study and any information or material will be welcomed.

We acknowledge our indebtedness to many collectors and workers who have kindly given us notes, specimens,

and opinions; among them we may mention: Dr. A. Davidson, Mrs. H. M. Hall, Mr. E. C. Jaeger, Dr. W. R. Maxon, Mr. G. L. Moxley, Mr. S. B. Parish, Mr. F. W. Peirson, Dr. Norma Pfeiffer, Mr. Fred Reed, Mrs. G. R. Robertson, Dr. J. H. Schaffner, and Mr. H. H. Tracy.

Pteridophytes

KEY TO FAMILIES

- A. Spores produced in sporangia borne in the axils of scale-like or grass-like leaves.
- B. Leaves small, scale-like; plant of moss-like aspect and of dry situations. VI. SELAGINELLACEAE.
- BB. Leaves grass-like; plant apparently stemless and of onion-like aspect, of moist situations. V. ISOETACEAE.
- AA. Spores not produced as above.
- B. Sporangia produced in terminal cone-like spikes; stems tubular and jointed VII. EQUISETACEAE.
- BB. Sporangia not in cones, stems not as above.
 - C. Plant small, one-leaved; each leaf bearing an erect fertile spike or panicle. II. OPHIOGLOSSACEAE.
 - CC. Plant small to large, more than one-leaved; leaves producing sporangia on under side or in special sporocarps.
 - D. Fern-like, homosporous. I. POLYPODIACEAE.
 - DD. Not fern-like; heterosporous.
 - E. Leaves distinctly peltioided, not crowded; blade present or absent. III. MARSILEACEAE.
 - EE. Leaves minute and loosely imbricated on pinnately branched stems. IV. SALVINIACEAE.

I. POLYPODIACEAE.

KEY TO GENERA

- A. Sporangia marginal, with leaf-edge more or less incurved and covering them.
- B. Reflexed leaf-margin not continuous appearing as separate large indusia; ultimate segments of frond at least 1 cm. broad; maidenhair ferns. 13. ADIANTUM.
- BB. Reflexed leaf-margin continuous, or if discontinuous ultimate segments of frond 1-3 mm. broad.

C. Fronds conspicuously dimorphous; fertile pinnae very narrow; high montane. 12. *CRYPTOGRAMMA*.

CC Fronds uniform or nearly so.

D. Stipes light colored, not brown; fronds ternate; an inner indusium present, making the covering of the sori double; fronds large and coarse, 3-12 dm. long. 14. *PTERIDIUM*.

DD. Stipes dark, brown to purplish (light in *Pellaea andromedaefolia*); no inner indusium present; fronds $\frac{1}{2}$ -3 dm. long.

E. Sori naked, leaf-margin scarcely if at all inrolled. 10. *NOTHOLAENA*.

EE. Sori covered with inrolled leaf-margin.

F. Inrolled leaf-margin continuous; pinnules 3-10 mm. long, thick and leathery. 9. *PELLAEA*.

FF. Inrolled leaf-margin not continuous or if continuous pinnules only 1-3 mm. long and beadlike, less firm, not thick nor leathery. 11. *CHEILANTHES*.

AA. Sporangia on back of frond, not at the margin, leaf-margin not incurved.

B. No indusium present, sporangia naked.

C. Fronds once pinnate; stipe light colored; sporangia in definite circular sori in two rows on each pinna. 15. *POLYPODIUM*.

CC. Fronds more than once pinnate, stipe dark; sporangia not in circular sori but in bands.

D. Plants not powdery below, or if powdery below with slightly inrolled margin. 10. *NOTHOLAENA*.

DD. Plants powdery below and margin not inrolled. 8. *PITYROGRAMMA*.

BB. Indusium present, covering sporangia.

C. Indusium distinctly longer than broad in outline.

D. Sori in chain-like rows parallel to the midrib of the pinnule; large coarse fern with fronds 4-6 ft. high. 7. *WOODWARDIA*.

DD Sori oblique to the midrib of the pinnules.

E Sori straight; fronds simply pinnate, not over $1\frac{1}{2}$ dm. long. 6. *ASPLENIUM*.

EE. Sori curved; fronds at least bipinnate, over 3 dm. long. 5. *ATHYRIUM*.

CC. Indusium circular in outline, peltate or reniform.

D. Indusium orbicular, centrally attached; leaves once pinnate, basal pinnae sometimes bipinnate; texture coriaceous. 4. *POLYSTICHUM*.

DD. Indusium not centrally attached; leaves at least bi-pinnate throughout; texture not coriaceous.

E Stipes slender, less than $1\frac{1}{2}$ mm. in diam.; blade of frond 1- $1\frac{1}{2}$ dm. long and $\frac{1}{2}$ - $\frac{3}{4}$ dm. wide.

F. Indusium under the sorus, with stellate divisions.

1. **WOODSIA.**
- FF. Indusium hood-like, fixed on one side with broad base.
2. **CYSTOPTERIS.**
- EE. Stipes coarser, 2-4 mm. in diam.; blade of frond $2\frac{1}{2}$ -5 dm. or more long, 1-2 dm. broad.
- F. Indusium distinctly reniform and quite circular in outline, attached along the sinus.
3. **THELYPTERIS.**
- FF. Indusium merely curved, elongate rather than round, attached along the inner side.
5. **ATHYRIUM.**

1. WOODSIA.

WOODSIA OREGANA D. C. Eaton, Can. Nat. II **2**: 90.
1865.

Physematum oreganum Trev. *Woodsia obtusa* var. *Lyallii* Hook.

Illus.: Eaton, Ferns No. Am. pl. 71, fig. 1-4. 1880.

In Southern California this fern has been collected only in the San Bernardino Mountains! where it is infrequent about rocky places on north-facing slopes above 7000 ft. altitude in the Canadian and Transition zones (Munz 6237, 6302; Parish, Zoe **4**: 167. 1893. Fern Bull. **12**: 11. 1904. Pl. World **20**: 170. 1917); in the Santa Rosa Mts.! where it occurs in similar situations (Munz 5868, 5890); in the Providence Mts.! where a few plants were collected by the authors in moist gravel in a narrow gulch at 4,200 feet in the Upper Sonoran Zone; and in the Panamint Mts.! where it has been collected at 9,300 ft. alt. in Hanaupah Canyon (Dixon, U. C. Herb.). The Providence Mountain collection was erroneously reported as *W. scopulina* (Munz & Johnston, Bull. Torrey Cl. **49**: 31. 1922).

2. CYSTOPTERIS.

CYSTOPTERIS FRAGILIS (L.) Bernh. Schrad., Neues Journ. Bot. 1²: 27. 1806. Brittle fern. Bladder fern. *Polypodium fragile* L. *Filix fragilis* (L.) Underw. Illus.: Frye & Jackson, Am. Fern Jour. 3: pl. 7, f. 5-6. 1913. Hall, A. Yosemite Flora p. 39. 1912. Eaton, Ferns No. Am. pl. 53, f. 1-8. 1880.

Restricted to the higher mountains where it occurs in varying abundance in wet places from the Upper Sonoran to the Canadian Zone, from 3500 to over 9,000 ft. alt., and in drier rocky places of northern exposure up to the tops of the highest peaks. In our range known only from the mountains of Ventura County! (Dudley & Lamb 4547), the San Bernardino Mts.! (Parish, Pl. World 20: 170, 1917), San Gabriel Mts.! (Johnston, Pl. World 22: 79. 1919), San Jacinto Mts.! (Jaeger 274, Munz & Johnston 5386, and Hasse, Dudley Herb.), and mountains of San Diego County! (Stokes, Dudley Herb., and Abrams 3798).

3. THELYPTERIS.

A. Veins of pinnules simple; indusium hairy T. AUGESCENS.

AA Veins of pinnules freely forking; indusium not hairy.

B. Lower basal pinnule usually with a semicordate base, this over-lying the primary rachis; veinlets all ending in salient, spine-like teeth; common at middle and low altitudes.

T. ARGUTA.

BB. Lower basal pinnule not semicordate at base, and not over-lying the primary rachis; veinlets fewer, usually ending in curved teeth; rare, at high altitudes. T. FILIX-MAS.

THELYPTERIS augescens (Link), n. comb.³

Sweet fern. Spreading wood-fern.

In wet ground in shaded canyons in the Upper Sonoran Zone, below 3000 ft. altitude. Known in our

³ *Aspidium augescens* Link, Fil. Sp. B. 103. 1841. *Aspidium puberulum* Féé, Mém. 40. 1865. *Dryopteris Féei* C. Chr. Ind. Fil. 264. 1905. *Dryopteris augescens*, var. *puberula* C. Chr. Vid. Selsk. Skr. VII. 10. 184. 1913. *Thelypteris normalis* Moxley Bull. So. Cal. Acad. Sci. 19: 57. 1920. *Thelypteris Féei* Moxley op. cit. 20: 34. 1921.

range from only a few stations: Santa Barbara! (Parish, Fern Bull. **12**: 10. 1904); Eaton Canyon!, San Gabriel Mts. (Parish, Muhlenbergia **3**: 57. 1907); Roberts and Fish Canyons, San Gabriel Mts. (acc. to Moxley, in lit.); and Tahquitz Canyon!, Colorado Desert base of the San Jacinto Mts. (*Labouchere*, U. C. Herb.). This is the plant which, until recently, was almost universally known in California literature as *Aspidium* or *Dryopteris patens*. Christensen, however, has shown that the true *Aspidium patens* of Swartz is a different species, occurring in tropical America. Moxley has called our California plant *T. Feei*, but it does not seem to be essentially different from any of the Mexican forms of *T. augescens*, as defined by Christensen. All these forms appear to be best treated as belonging to a single species; we are accordingly taking up the specific name *augescens*, the oldest applicable to the concept.

THELYPTERIS ARGUTA (Kaulf.) Moxley. Bull. So. Cal. Acad. **19**: 57. 1920.

Wood fern.

Aspidium argutum Kaulf. *Aspidium rigidum argutum* D. C. Eaton. *Dryopteris rigida arguta* (Kaulf.) Underw. *Lastrea arguta* Brack. *Nephrodium argutum* Diels. *Nephrodium rigidum argutum* Davenp. *Dryopteris arguta* (Kaulf.) Watt.

Illus.: Eaton, Ferns No. Am. pl. 46. 1880. Hall, A Yosemite Flora, p. 38. 1912.

Common on shaded coastal slopes of the Upper Sonoran Zone below 3500 ft. alt.; ascending occasionally into Lower Transition Zone to 6500 ft. alt.! Approaching the desert at Warners Hot Springs! (*Coomb*, Cal. Acad. Herb.); known also on Catalina Island! (Brandegee, *Zoe* **1**: 115. 1890), Santa Cruz Island! (Greene, Bull. Cal. Acad. **2**: 415. 1887), and Santa Rosa Island! (Brandegee, Proc. Cal. Acad. (2) **1**: 218. 1888). The *Aspidium aculeatum* of Lyon's list (Bot. Gaz. **11**: 334.

1886) from Catalina is probably to be referred here (Brandegee, *Zoe* **1**: 148. 1890).

THELYPTERIS FILIX-MAS (L.) Nieuwl. *Am. Mid. Nat.* **1**: 226. 1910.

Male fern. Sweet fern.

Polypodium Filix-mas L. *Aspidium Filix-mas* Sw. *Dryopteris Filix-mas* (L.) Schott. *Polystichum Filix-mas* Roth. *Nephrodium Filix-mas* Rich.

Illus.: Eaton, *Ferns* No. Am. pl. 41, 1879. Frye & Jackson, *Am. Fern Jour.* **4**, pl. 9, pl. 11, f. 3 & 4. 1914. Britton & Brown, *Illus. Flora*, **1**, fig. 45. 1913.

Among rocks in Holcomb Valley! in San Bernardino Mts. Only a single collection is known from Southern California, that was made by Parish Brothers in August, 1882, at 8000 ft. alt. (Parish, *Fern Bull.* **12**: 10. 1904 and Maxon, *Am. Fern Jour.* **11**: 4. 1921). No doubt through a slip of the pen, Maxon accredited this fern to Snow Canyon instead of Holcomb Valley (*Am. Fern Jour.* **11**: 107. 1921).

(*To be continued*)

Ferns as House Plants.¹

R. C. BENEDICT.

Ferns! What does the word bring to mind? To me it recalls the outdoors; woodland, streamside, mountain slopes. Ferns suggest tropical forests and jungles; or, to let the thought run back in time, ferns call up vistas of ancient vegetation when no flowering plants existed. Then ferns were the predominant plant type, and from the dead ferns and similar plants of that period, by some extraordinary reduction process, we have coal.

¹Reprinted also as a Leaflet of the Brooklyn Botanic Garden. The plants illustrated were grown at the Brooklyn Botanic Garden, and the photographs for the illustrations were made by Louis F. Buhle, Garden photographer.